



U.S. Department
Of Transportation
**Federal Highway
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

April 4, 1997

Refer to: HNG-14/SS-69A

Mr. D. Lance Bullard, Jr.
Safety Quest, Inc.
505 University Drive
Suite 701
College Station, Texas 77840

Dear Mr. Bullard:

This is in response to your letter to Mr. Nicholas Artimovich, received on March 10 which requests the Federal Highway Administration's acceptance of the Marion Steel two-bolt "Slip Safe" U-channel breakaway sign support system for use in weak soil with an embedment depth of 762 mm and the used of a PLS-02 soil plate. Accompanying your letter was a Texas Transportation Institute report, "Pendulum Testing of the Slip Safe Sign Support in Weak Soil," dated February 1997, and a video of the crash testing. You provided additional information at our request via telephone on March 25 regarding the change-in-velocity of the pendulum.

Except for the mass of the pendulum as discussed below, the testing was done in accordance with the National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features. Requirements for breakaway supports are those in the American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals. Drawings of the test installation and details of the breakaway system are enclosed.

The initial crash testing of the Slip Safe breakaway support design was conducted on prototype hardware using passenger cars. Although the prototype testing was successful, we asked for crash tests using actual production models of the Slip Safe hardware. That additional testing was done using the TTI pendulum with a mass of 199 kg instead of the 820 kg call for in the NCHRP Report 350. Both the prototype hardware, which had previously been tested using cars, and the production models were tested with the 1099-kg pendulum giving acceptable and comparable results. You received our concurrence in the use of the same 1099-kg pendulum for the current study via our letter dated January 13, which recognized the previous "side-by-side" comparison testing between the prototype and production models using automobile and pendulum testing.

The Slip Safe system was found acceptable (our letter of September 18, 1996) for use with up to three 5.9 kg/m posts embedded 1425 mm in to weak soil with soil plates and embedded 815 mm into strong soil without a soil plate. The present study was to optimize the embedment length of the posts when used in weak soil. Single 5.9 kg/m posts or “back-to-back” posts with a total unit mass of 11.8 kg/m were used. In each test one “single” or one pendulum, the target impact speed was reduced from 35 km/h to approximately 28 km/h. In addition an adjusted maximum allowable occupant impact velocity was 4.5 m/s instead of the 5.0 m/s specified in the NCHRP Report 350 was assumed. Similarly an adjusted maximum allowable ride down acceleration of 15 Gs was assumed instead of the 20 Gs permitted in the NCHRP Report 350.

The three tests are summarized in the following table:

Test # 4000001-	-MSC P1	-MSC P2	-MSC P3	Previous Product Test	Previous Prototype Test
Post Configuration	Back to back	Back to back	Single	Single	Single
Bolt Torques	68 N m	136 N m*	47 N m	47 N m	47 N m
Embedment Depth	762 mm	762 mm	762 mm	840 mm	840 mm
Soil Plate Present	Yes	Yes	Yes	No	No
Impact Speed	28.32 km/h	28.1 km/h	27.74 km/h	30.8 km/h	31.0 km/h
Residual Base Displacement	3 mm	13 mm	Not significant	Non significant	None
Pendulum Delta V	0.29 m/s	0.44 m/s	0.31 m/s	0.28 m/s	0.18 m/s
Occupant Impact Speed	None	None	None	None	None
Stub Height	102 mm	102 mm	102 mm	89 mm	89 mm

* This torque value, well in excess of that recommended, was used to show that the system would perform acceptably under this condition.

These results met the change-in-velocity and stub-height requirements adopted by the FHWA. Because there was insignificant movement of the bases during these three single support tests, the Slip Safe system should perform in an acceptable manner when two or three posts are installed within a 2.1-meter span. Therefore, sign support systems consisting of one, two, or three single (5.9 kg/m) or back to back (11.8 kg/m) post using the Slip Safe breakaway hardware as shown in the enclosed drawings are acceptable for use on projects on the National Highway System, within the range of conditions tested, where breakaway systems are required if proposed by a State. In weak soil, post embedment must be a minimum of 760 mm and soil plates are required.

All other conditions in our letter of September 18, 1996 remain in effect.

Sincerely yours,

Dwight A. Horne, Chief
Federal-Aid and Design Division

Enclosures

Geometric and Safety Design Acceptance Letter SS-69A

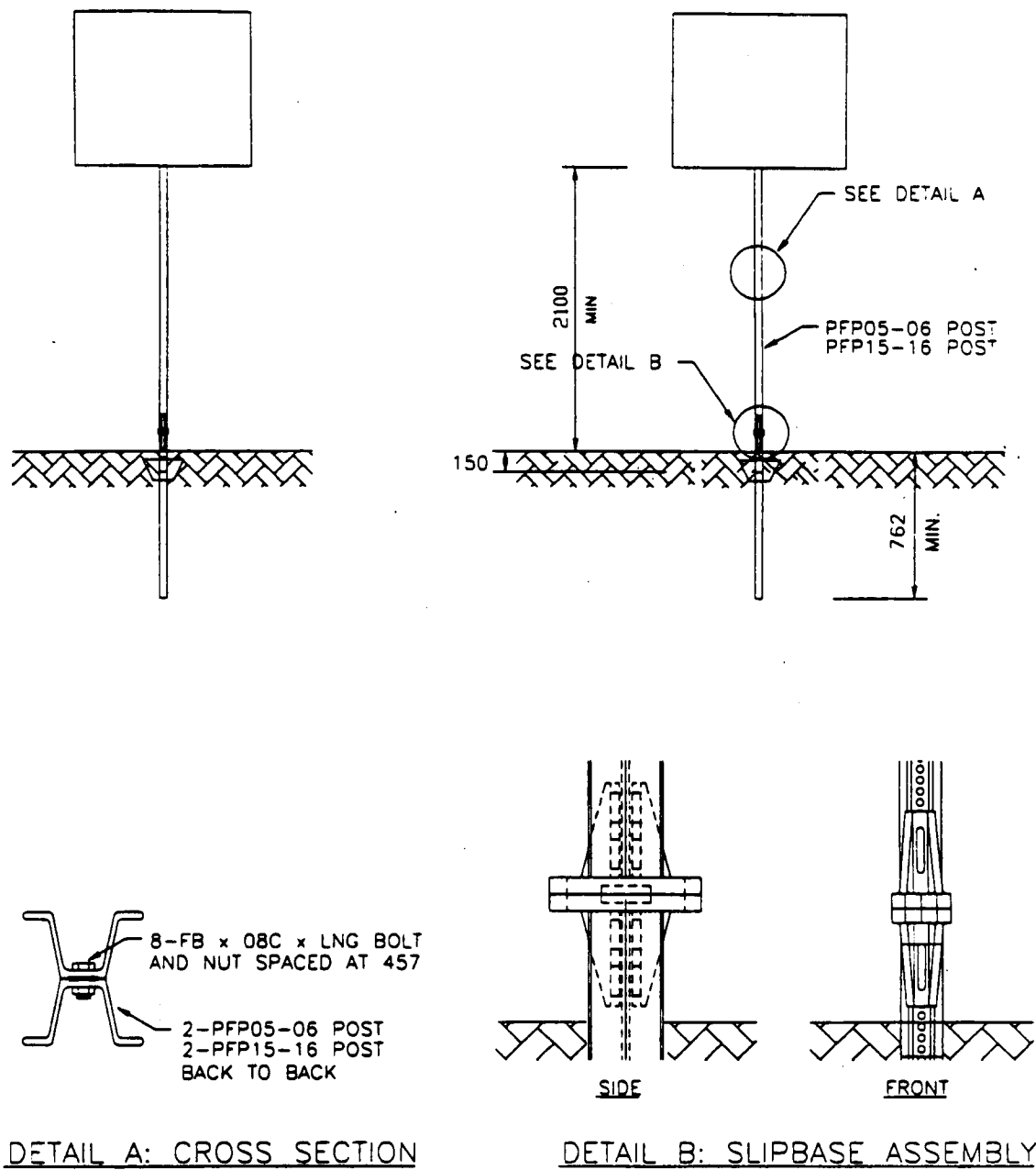
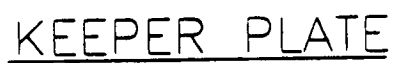


Figure 3. Details of the back-to-back SLIP SAFE sign support assembly.

"WEAK SOIL INSTALLATION WITH SOIL PLATES NOT SHOWN"



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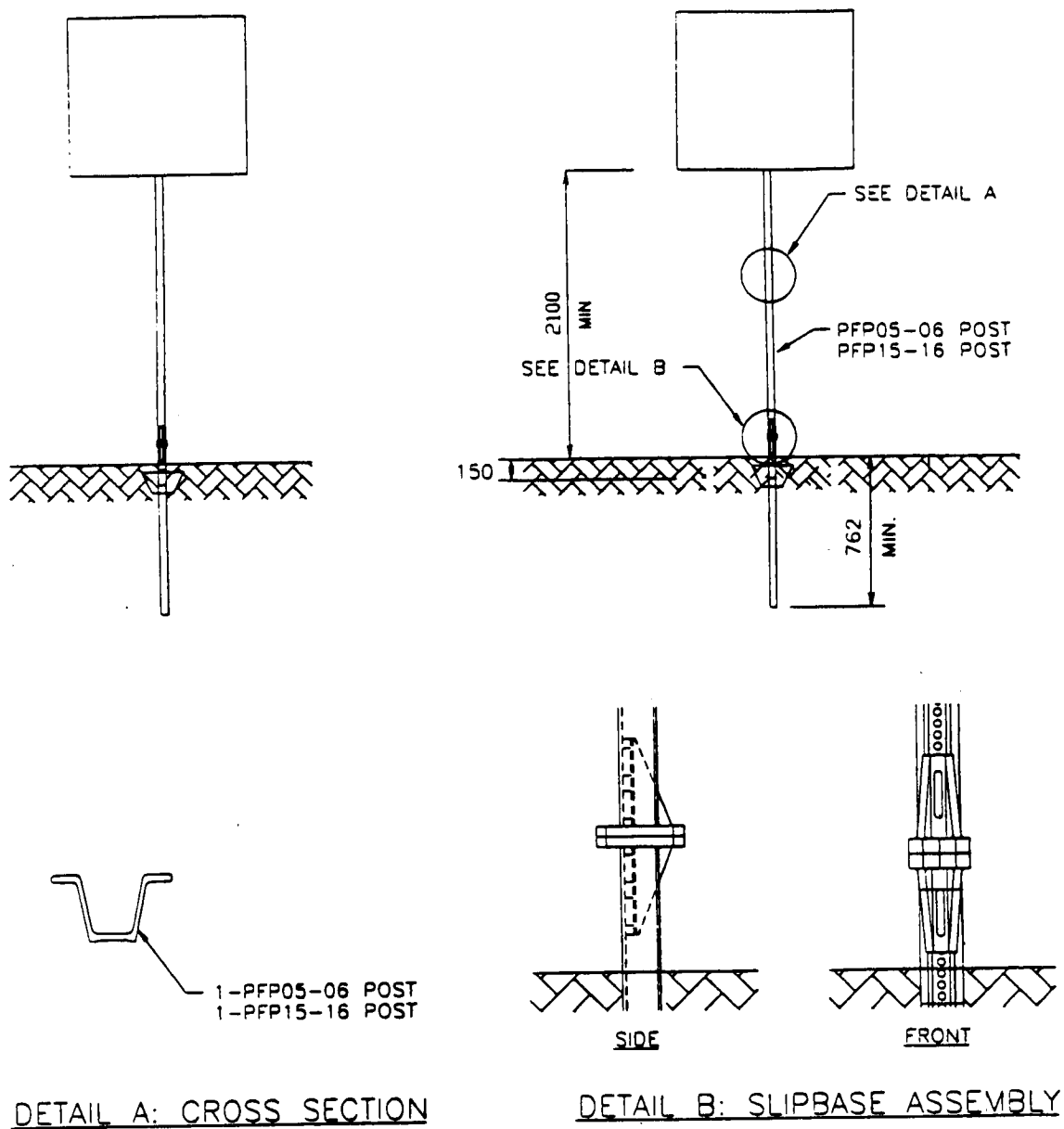
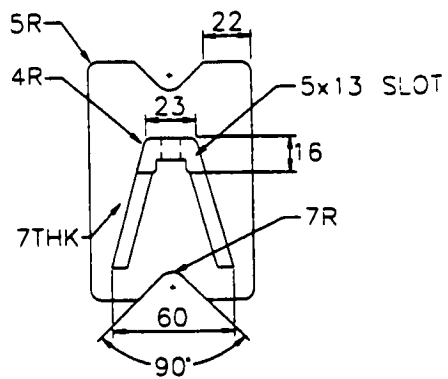
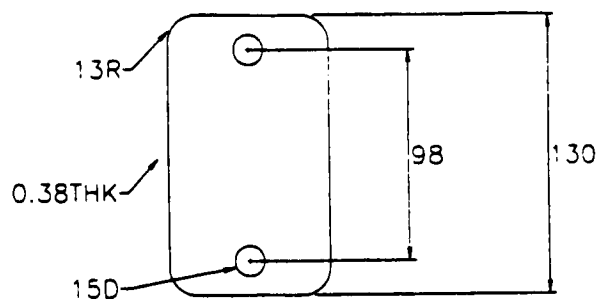


Figure 5. Details of the single SLIP SAFE sign support assembly.

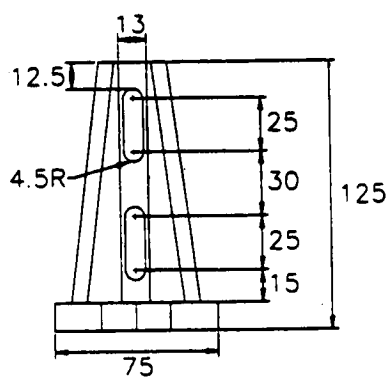
"WEAK SOIL INSTALLATION WITH SOIL PLATES NOT SHOWN"



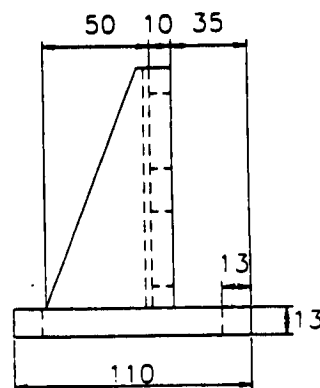
TOP



KEEPER PLATE



FRONT



SIDE

Figure 5. Details of the single SLIP SAFE sign support assembly (continued).